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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Gregory Andrew Roy

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10/17/2006

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EXAMINER

NGUYEN, PHU K

ART UNIT

PAPER NUMBER

2628

DATE MAILED: 10/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Interview Summary	Application No.	Applicant(s)	
	10/642,857	ROY ET AL.	
	Examiner	Art Unit	
	Phu K. Nguyen	2628	

All participants (applicant, applicant's representative, PTO personnel):

(1) Phu K. Nguyen. (3)_____.

(2) Jason Feldmar. (4)_____.

Date of Interview: _____.

Type: a) ☒ Telephonic b) ☐ Video Conference
c) ☐ Personal [copy given to: 1) ☐ applicant 2) ☐ applicant's representative]

Exhibit shown or demonstration conducted: d) ☐ Yes e) ☒ No.
If Yes, brief description: _____.

Claim(s) discussed: None.

Identification of prior art discussed: 60/025,528.

Agreement with respect to the claims f) ☒ was reached. g) ☐ was not reached. h) ☐ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: Applicant requests sending another copy of 60/025,528 since there are several missing pages from the office action and re-setting the response date. Examiner agrees..

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN A NON-EXTENDABLE PERIOD OF THE LONGER OF ONE MONTH OR THIRTY DAYS FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.



PHU K. NGUYEN
PRIMARY EXAMINER
GROUP 2300

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

Examiner's signature, if required

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews

Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.

All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

DESCRIPTIONHANDHELD PORTABLE DIGITAL
GEOGRAPHIC DATA MANAGER

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Background of the Invention

It is often necessary for insurance adjusters, geophysicists, construction workers, real estate developers, and others working in the field to gather and assimilate geographic, topographic, visual (*i.e.*, photographic), and other information about a site. These sites may be in locations which are remote and/or have no readily available access to computers or even power sources. Currently, there is no handheld portable device for gathering and processing such information.

Printed maps are available for viewing almost all features that have geographical locations. A limitation of printed maps is that a user must manually sort through the entire map in order to find the relevant geographical features. Electronic maps have recently become available to replace paper maps for some applications. A map database is stored in a memory storage device as a bit map or as vectors that point to a map character.

Many electronic location determination systems are available or have been proposed to provide electronic location information to a user equipped with a location determination receiver. Ground-based location determination systems are well known and include systems that were developed primarily for communications, such as cellular telephone, FM broadcast, and AM broadcast.

The Global Positioning System (GPS) is a global navigation system that enables the user to utilize signals broadcast from satellites in order to identify positions. GPS systems are well known and widely used to accurately locate specific positions. GPS systems, which utilize a network of satellites to identify locations on the ground, are widely used in automotive and nautical navigation, construction, mining, and farming, as well as in a variety of other applications. See, for example, U.S. Patent No. 5,528,248 and PCT Application No. WO 95/05686. Other satellite

positioning systems, such as the Global Orbiting Navigational System (GLONASS) are also known. Cartographers, utilities operators, wildlife managers, and others have used GPS technology in conjunction with Geographical Information Systems (GIS) to augment map making procedures and other field work, particularly in remote
5 locations. In such applications, there has been an increasing use of computers to facilitate data storage and retrieval.

Personal Digital Assistant (PDA) is a generic name for a handheld personal computing device having a volume in the range of about 200 to 1200 cubic centimeters. PDAs can have as much computing power as some desktop personal
10 computers and have been used in a wide variety of applications, including mapping.

Unfortunately, hardware and software hurdles have limited the ability to utilize multicomponent data gathering systems in the field. Connecting equipment such as a GPS, a two-way radio, and a handheld pen computer for use in the field poses a number of obstacles. Many wires and cables work fine on a desktop computer but
15 not on a handheld device. The essence of the subject invention is the development of a rugged, fully-integrated, easy to use handheld multicomponent field data gathering system for gathering positional, image, and other data, and simultaneously processing this information.

Brief Summary of the Invention

The subject invention concerns methods and devices which aid in collecting and verifying planning and engineering field data. The devices of the subject invention are handheld portable personal digital assistants (PDAs). The PDAs of the subject invention are designed to meet the needs of, for example, the construction
25 and utility industry. The methods and devices of the subject invention are also applicable to other tasks such as environmental sampling, agricultural field data collection, property appraisal, and construction inspection. Specific applications include the gas, water, sewer, telephone, and cable TV utilities; in local, state, and federal government inspection agencies; and in the insurance and transportation
30 industries.

The PDAs of the subject invention comprise multiple components interfaced with a central processing unit (CPU). Preferably, these multiple components include a digital camera, a GPS processing component, wireless radio communication capability, a digital compass with inclinometer, and user interaction capability. In a preferred embodiment of the subject invention, the PDA comprises at least two digital cameras which facilitate the determination of the distance from the PDA to an object. The digital compass and inclinometer of the PDA enable the determination of the orientation of the camera so that the exact location of an object which appears in the images from the digital cameras can be readily determined.

In a preferred embodiment of the subject invention, the PDA comprises capability for wireless transmission of data to a host computer at a remote location. The PDA of the subject invention can further comprise a touch screen controller and/or a voice controller. The PDA of the subject invention further comprises a power source. This power source may be, for example, a battery pack and any necessary electrical components to modulate the current so that it is compatible with the requirements of the various data gathering and processing components.

In a preferred embodiment, the integrated handheld field digital data mapping device of the subject invention is capable of:

- (1) collecting and mapping global position system (GPS) data;
- (2) reporting GPS location, speed, and direction in a seamless fashion;
- (3) reporting orientation including magnetic direction, pitch, and roll;
- (4) collecting multiple pairs of color digital images (photographs) used to measure distance to an object;
- (5) voice command and voice query;
- (6) touch sensitive icon control;
- (7) providing icon-driven notes relating to field observations;
- (8) two-way wireless data transfer with host database station;
- (9) mapping the present environment in points, lines, and area features; and
- (10) providing navigation assistance to a desired location.

Brief Description of the Drawings

Figure 1 is a block diagram showing the components of one embodiment of the device of the subject invention.

Figure 2 is a schematic showing the determination of the distance to an object from the device of the subject invention using the images produced by two digital cameras.

Figure 3 is a schematic of the embedded controller processor system.

Figure 4 is a schematic of the digital compass and inclinometer.

Figure 5 is a schematic of the flash memory subsystem.

Figure 6 is a schematic of the GPS receiver subsystem.

Figure 7 is a schematic of the LCD display subsystem.

Figure 8 is a schematic of the touch screen interface and module.

Figure 9 is a schematic of the stereo digital camera subsystem.

Figure 10 is a schematic of the digital stereo range finder subsystem.

Figure 11 is a schematic of the voice command subsystem.

Figure 12 is a schematic of the wireless network interface.

Detailed Disclosure of the Invention

The subject invention provides materials and methods which are highly advantageous in collecting and utilizing field data for use in a wide variety of applications. The personal digital assistant (PDA) of the subject invention is a multi-component system for gathering positional, image, and other data, and simultaneously processing this information. The subject invention is also applicable to other tasks such as construction and utility monitoring, environmental sampling, agricultural field data collection, and property appraisal. Specific applications include the gas, water, sewer, telephone, and cable TV utilities; in local, state, and federal government inspection agencies; and in the insurance and transportation industries.

The handheld data gathering device of the subject invention can, in a preferred embodiment, comprise:

- 5 (a) An imbedded computer capable of processing image data and interfacing to multiple data sensing modules. The user sees the graphical and alpha numeric results on a LCD touch screen, either color or black and white. The user controls the system through touching action icons or via voice commands. Alternatively, a mouse and keyboard may be used for more conventional user input and control of the system
- 10 (b) A global position receiver (GPS) capable of accurately capturing geographic location with post processing or real-time differential correction capability. Better than one meter accuracy can be achieved with such a system. An interface from the GPS to the central computer to process the location data and the necessary software to display and record the results.
- 15 (c) A digital compass capable of providing accurate heading (about one degree). An interface from the digital compass to the central processor and software capable of processing and displaying and storing the direction data.
- 20 (d) Digital inclinometers capable of providing accurate pitch and roll data (less than one degree of error) for a plane parallel to the center line of the camera's field of view. The serial interface from the inclinometer to the imbedded computer transfers the pitch and roll data. The system software is responsible for processing, displaying and storing the pitch and roll data. It also makes the data available for use in calculating new coordinates.
- 25 (e) A pair of digital cameras with matched optics mounted with the lenses in the same plane and with the line through the center of view of each lens parallel to the line through the other. An interface from the cameras to the imbedded computer processor and software capable of displaying, processing, and storing the images.

- (f) Stereo image processing software or hardware algorithms capable of locating a selected object in one image in the stereo image pair. Once the object is located in the stereo pair image the displacement between the two objects is used in conjunction with the optical characteristics of the lenses and the spacing of the lenses to calculate distance to the object of interest. Accuracy of plus or minus one inch is achieved at fifteen feet, and about plus or minus a foot at thirty feet can be readily achieved using lenses which are only about nine inches apart. The distance accuracy drops off as the distance increases; however, longer range accuracy is achieved by sliding the cameras out to a wider spacing and/or attaching telephoto lenses to the cameras. For example, a 2x telephoto lens makes the accuracy plus or minus one inch at 30 feet. The PDA can be made with lenses spaced at nine inches to keep the handheld unit small; however, when extended to 18 inches the accuracy is increased. The PDA can have a horizontal resolution of 496 pixels. Image sensors with a higher resolution also increase distance accuracy. For maximum distance accuracy a higher resolution sensor is used in conjunction with widely spaced lenses and telephoto lenses
- (g) Data stored in the system may be sent to a base unit via a wireless network made up of two-way digital packet radios. Alternatively, data can be exchanged via an infrared link, a serial cable, a wired network connection, a PC Card, or a floppy disk.

In a preferred embodiment, the PDA of the subject invention utilizes a pair of digital cameras which are not only able to provide photographic images of sites of interest but also to facilitate the determination of the distance from the PDA to any object in the images produced by the digital cameras. The distance determination is carried out by the PDA utilizing a software program which compares the images produced by the two cameras in order to determine the distance apart a single object is in the two images. This distance apart in the images is directly proportional to the distance that the object is from the PDA. Through a series of straightforward

computational steps, the PDA of the subject invention analyzes the distance between the object's images and converts this to the distance from the PDA to the object. The PDA simultaneously records the pitch and roll of the PDA as determined by an inclinometer, and it records the magnetic direction of the PDA as determined by a digital compass. This information, together with the GPS information, are all processed essentially simultaneously by the CPU and can be transmitted to a remote host computer by wireless communication components.

The PDA of the subject invention further comprises a display screen and a means for the operation to interact with the PDA. This means of interaction may be, for example, by a touch screen or by voice recognition.

A person skilled in this art having the benefit of the instant disclosure would readily appreciate that a variety of modifications could be made to the specific embodiments exemplified herein without departing from the spirit of the instant invention. For example, the GPS function of the PDA is for the purpose of providing a location for the PDA. This function could be performed by other locating means including, but not limited to, other satellite positioning systems and ground-based systems. Certainly, when the device of the subject invention is to be used indoors or in the vicinity of tall buildings, it may be advantageous to use a ground-based location system rather than a satellite system. Also, the device could display a map which the user could touch or in some other way designate the location of the PDA. In yet another embodiment, the PDA may be stationary, in which case its position will be known.

Another embodiment of the subject invention utilizes more than two cameras in order to provide enhanced spatial determination of an object. In another embodiment, the cameras of the subject invention can be moved to increase the distance between the lenses so as to enhance the accuracy of distance determinations, especially for objects located at a substantial distance from the PDA. The moveable camera lenses can be retractable to their original position for convenience. The camera may utilize wide-angle lenses for objects close to the PDA.

In a further embodiment, the camera may include an infrared sensor for heat detection. The PDA may be equipped with additional chemical and environmental sensors to augment the type and amount of data which can be gathered.

5 In a preferred embodiment, the PDA of the subject invention will have a real-time operating system to coordinate the essentially simultaneous collection of multiple types of data.

The connections and interfaces of the various components of the PDA of the subject invention can be designed and produced by one skilled in this art having the benefit of the teachings provided herein.

10

Following are examples which illustrate procedures for practicing the invention. These examples should not be construed as limiting. All percentages are by weight and all solvent mixture proportions are by volume unless otherwise noted.

15 Example 1 — Handheld Portable Data Manager

In a specific embodiment, the PDA of the subject invention can run Microware's OS-9 (OS-9 Version 3.0 Documentation, 1995 Microware Systems Corp., Des Moines, Iowa) embedded operating system from ROM. The heart of the computer is a Gespac SBSG8-10 (Gespac Inc., Mesa, AZ) with two megabytes of ROM and one megabyte of static RAM. It has a Motorola 68340 CMOS low power processor with six serial ports. See Figure 3.

20 A small carrier board holds two industry pack modules. The first has a GreenSprings IP-LCD VGA (Greenspring Computing Inc., Menlo Park, CA) controller interfaced with a small Sharp 640 x 480 TFT active matrix flat panel color screen. The color screen displays digital images, maps, and other data for verification and collection. See Figure 7. The second industry pack module is a storage module with eight megabytes of flash memory. See Figure 5.

25 The user interacts via a Dynapro touch screen (Dynapro SC3 Touch Screen Controller and Software Users Reference Version 1.1, 1995, Dynapro Thin Film Products) on the sixth serial port and/or via voice prompting and command provided

30

by a OKI semiconductor voice control module connected to the first serial port. See Figures 8 and 11.

5 A stereo pair of Gator Digital cameras (Gator Digital Camera Users Guide and Reference, 1994, Dycam, Chatworth, CA) are attached to the second serial port via a high speed synchronous connection. The two cameras provide stereo pairs of images for depth-of-field calculations and three-dimensional digitizing of objects of interest. See Figures 9 and 10.

10 An eight-channel Trimble GPS receiver (Trimble Navigation, Sunnyvale, CA) is on the third port. A DCI differential correction receiver which corrects the GPS data to 1-2 meter accuracy is connected directly to the GPS receiver. See Figure 6.

A Precision Navigation digital compass unit provides direction, pitch, and roll, as well as temperature, on the fourth port (Precision Navigation TCM2 Electronic Compass, 1994, Precision Navigation, Mountain View, CA). See Figure 4.

15 The last port is used for communication using a Digital Wireless spread spectrum which communicates at distances of up to one mile line-of-sight. The wireless packet radio link uses the tcp/ip protocol for compatibility with sending and receiving data over the Internet. See Figure 12.

20 The graphical user interface can be based on G-Windows (G-Windows and G-View Developers Manual, 1995, Gespac S.A., Geneva). G-Windows can run completely from ROM and provides an effective interface. G-View, a widget builder, is used for constructing object-oriented widgets to control the data sensors. The touch-sensitive color screen is used to display color and black-and-white digital images of objects under study and is used in the object documentation process. Objects are digitized by translating the GPS location of the data mapper to the object. The distance is calculated from the user touching the object of interest in the digital image and the computer automatically finding the same pattern in the stereo pair image. Bearing and orientation are calculated from the compass and inclinometer reading.

30 When in voice command and control mode, the system verbally prompts the operator for input and flashes the appropriate icon when the voice command from

the user is processed. This leaves the operator's hand free for other tasks. The voice command and control also aids in poor visibility situations and for users with visual handicaps.

5 Example 2 — Measurement of Remote Objects

Objects of interest can be measured in the field by touching two points on one picture and letting the system calculate a three dimensional coordinate for each point from the direction, pitch, and roll data , lens characteristics and lens spacing. Distance between points can be calculated. All of the data is stored with the stereo pair of
10 images for future processing with similar software on a desktop computer and/or if the user desires to capture more detailed information from the photo.

Example 3 — Three Dimensional Digitizing of Objects

As the user points the data collector unit in the direction of an object of
15 interest the GPS is providing location coordinates, the system is also monitoring the direction pitch and roll of the stereo pair of cameras. Once the relative three dimensional coordinate for the object under study is calculated from the stereo data and the three dimensional heading of the camera the actual location of the object is calculated and recorded.

20

Example 4 — Mapping Objects in the Field

The coordinate derived for the objects located in the stereo pairs of images is used to construct a geographic information system map layer. Each object can have attribute data stored with it including a photo of the object, its dimensions, and
25 other attribute data the user desires to include. For example a verbal description can be digitized by the voice processor for a tag attribute or an icon driven system can be used to capture field observations.

Example 5 — Special Processing of Pictures

Each stereo pair of pictures has location and directional data stored with it thus the plane of the photograph is known. This makes it possible to correct the picture for orientation. For example if the picture was taken at an angle the image
5 can be rotated to remove the tilt in the picture. Also a floating scale is placed on the surface of an object in a picture so dimensions can be directly read off by the user. The units on the scale are set automatically set from the information obtained from processing the stereo images and their associated data.

10 Example 6 — Field Correction of Existing Geographic Information System Data

Existing data is corrected in the field by loading an existing map data set on to the system. The user takes the map into the field. As features on the map are photographed the user touches the object on the map and the same one in the stereo
15 pair of pictures. The system automatically calculates the displacement to the object and translates the GPS coordinate of the handheld data mapper to the object. This new accurate coordinate is then used to update the old feature coordinates including addend a altitude coordinate.

Example 7 — Generation of Three Dimensional Wire Frame Sketches

20 Several algorithms are used to enhance the edges of objects of interest. For example the lapse transform of an image will highlight the edges of an object in the picture. These algorithms are used to assist the calculation of the displacement measurement of the image pairs of the same objects in the stereo pair of digital photographs. Once the images are highlighted the system can then generate a wire
25 frame three dimensional model for the object under study. In complex situations the user could take several pairs of images from different sides of the object under study. A more complete digital three dimensional map and model of the object is then constructed from the data.

It should be understood that the examples and embodiments described herein are for illustrative purposes only and that various modifications or changes in light thereof will be suggested to persons skilled in the art and are to be included within the spirit and purview of this application and the scope of the appended claims.

References

Astec DC to DC converter, Astec America, Inc., Oceanside, CA.

Dibble, Peter (1994) *Insights, An Advanced Programmers Guide to OS-9 3.0 Edition*, Microware Systems Corp., Des Moines, Iowa.

Gator Digital Camera Users Guide and Reference (1994) Dycam, Chatworth, CA.

Dayan, Paul S. (1992) *The OS-9 Guru: The Facts*, Galactic Industrial Limited, Durham, UK.

Dynapro SC3 Touch Screen Controller and Software Users Reference, Version 1.1 (1995)
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Gespac GWSSSS-10 Low Power CMOS MC68340 Single Board System, 1995, Gespac Inc., Mesa, AZ.

Gespac Quad Asynchronous Serial Interfaces XSBSIO-2, 1995, Gespac, Inc., Mesa, AZ.

Greenspring Computer IP-LCD VGA Industry Pack, 1995, Greenspring Computing Inc., Menlo Park, CA.

OS-9 Version 3.0 Documentation, 1995, Microware Systems Corp., Des Moines, Iowa.

Precision Navigation TCM2 Electronic Compass, 1994, Precision Navigation, Mountain View, CA.

Sharp LQ64D142 TFT-LCD Module, 1995, Sharp Liquid Crystal Display Group, 1995, Camas, WA.

Trimble GPS Receiver, 1995, Trimble Navigation, Sunnyvale, CA.

Claims

1 1. A portable, handheld data gathering device comprising a processing unit
2 which is connected to, and communicates with, components which perform the
3 following functions:

- 4 (a) identify three-dimensional position of said device;
5 (b) provide pitch and roll of said device;
6 (c) provide digital photographic image;
7 (d) identify direction of said image relative to said device; and
8 (e) enable user interaction.

1 2. The device, according to claim 1, which further comprises a means for
2 wireless communication with a remote host computer.

1 3. The device, according to claim 1, which further comprises a power source.

1 4. The device, according to claim 1, wherein said three-dimensional position
2 is identified using the GPS.

1 5. The device, according to claim 1, which comprises two digital cameras.

1 6. The device, according to claim 5, wherein the distance between the two
2 digital cameras can be increased or decreased.

1 7. The device, according to claim 1, which comprises an inclinometer.

1 8. The device, according to claim 1, which comprises voice recognition
2 capabilities.

Abstract of the Disclosure

The subject invention provides devices and methods for efficiently and accurately gathering image and other field data using a handheld portable personal data assistant.

5

60/025528

Provisional Application
Docket No. UF-169P

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. : UF-169P
Applicant(s) : John Alexander
For : Handheld Portable Digital Geographic Data Manager

Box PROVISIONAL PATENT APPLICATION

Assistant Commissioner for Patents

Washington, D.C. 20231

CERTIFICATE OF MAILING BY EXPRESS MAIL (37 CFR 1.10)

EH677293810US

Express Mail No. _____ Date of Deposit: September 6, 1996

I hereby certify that the attached Provisional Application and Cover Sheet therefor, and Small Entity Declaration, with copies as required for authorization for use of deposit account No. 19-0065, are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and are addressed to: Box PROVISIONAL PATENT APPLICATION, Assistant Commissioner for Patents, Washington, D.C. 20231.

David R. Saliwanchik
Name of person mailing paper

David Saliwanchik
Signature

Applicant or Patentee: John Alex r Attorney's
Serial or Patent No.: _____ Docket No. UF-169P
Filed or Issued: _____
For: Handheld Portable Digital Geographic Data Manager

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9 (f) and 1.27 (c)) — NONPROFIT ORGANIZATION

I hereby declare that I am an official empowered to act on behalf of the nonprofit organization identified below:

NAME OF ORGANIZATION University of Florida
ADDRESS OF ORGANIZATION 223 Grinter Hall
Gainesville, FL 32611

TYPE OF ORGANIZATION

- ☒ UNIVERSITY OR OTHER INSTITUTION OF HIGHER EDUCATION
☐ TAX EXEMPT UNDER INTERNAL REVENUE SERVICE CODE (26 USC 501(a)(3))
☐ NONPROFIT SCIENTIFIC OR EDUCATIONAL UNDER STATUTE OF STATE OF THE UNITED STATES OF AMERICA
(NAME OF STATE _____)
(CITATION OF STATUTE _____)
☐ WOULD QUALIFY AS TAX EXEMPT UNDER INTERNAL REVENUE SERVICE CODE (26 USC 501(a) and 501(c)(3) IF LOCATED IN
THE UNITED STATES OF AMERICA
☐ WOULD QUALIFY AS NONPROFIT SCIENTIFIC OR EDUCATIONAL UNDER STATUTE OF STATE OF THE UNITED STATES OF
AMERICA IF LOCATED IN THE UNITED STATES OF AMERICA
(NAME OF STATE _____)
(CITATION OF STATUTE _____)

I hereby declare that the above identified nonprofit organization qualifies as a nonprofit organization as defined in 37 CFR 1.9 (d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, with regard to the invention described in the above-identified:

☐ PATENT ☒ APPLICATION

I hereby declare that rights under contract or law have been conveyed to and remain with the nonprofit organization identified above with regard to the above-identified invention.

If the rights held by the above identified nonprofit organization are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9 (d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9 (d) or a nonprofit organization under 37 CFR 1.9 (e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring their status as small entities. (37 CFR 1.27)

NAME _____
ADDRESS _____
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

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I acknowledge the duty to file, in this application or patent, notification of any change of status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28 (b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING Dr. Ronald M. Kudla
TITLE IN ORGANIZATION Director, Office of Technology Licensing
ADDRESS OF PERSON SIGNING 186 Grinter Hall
Gainesville, FL 32611

SIGNATURE Ronald M. Kudla DATE September 6, 1996

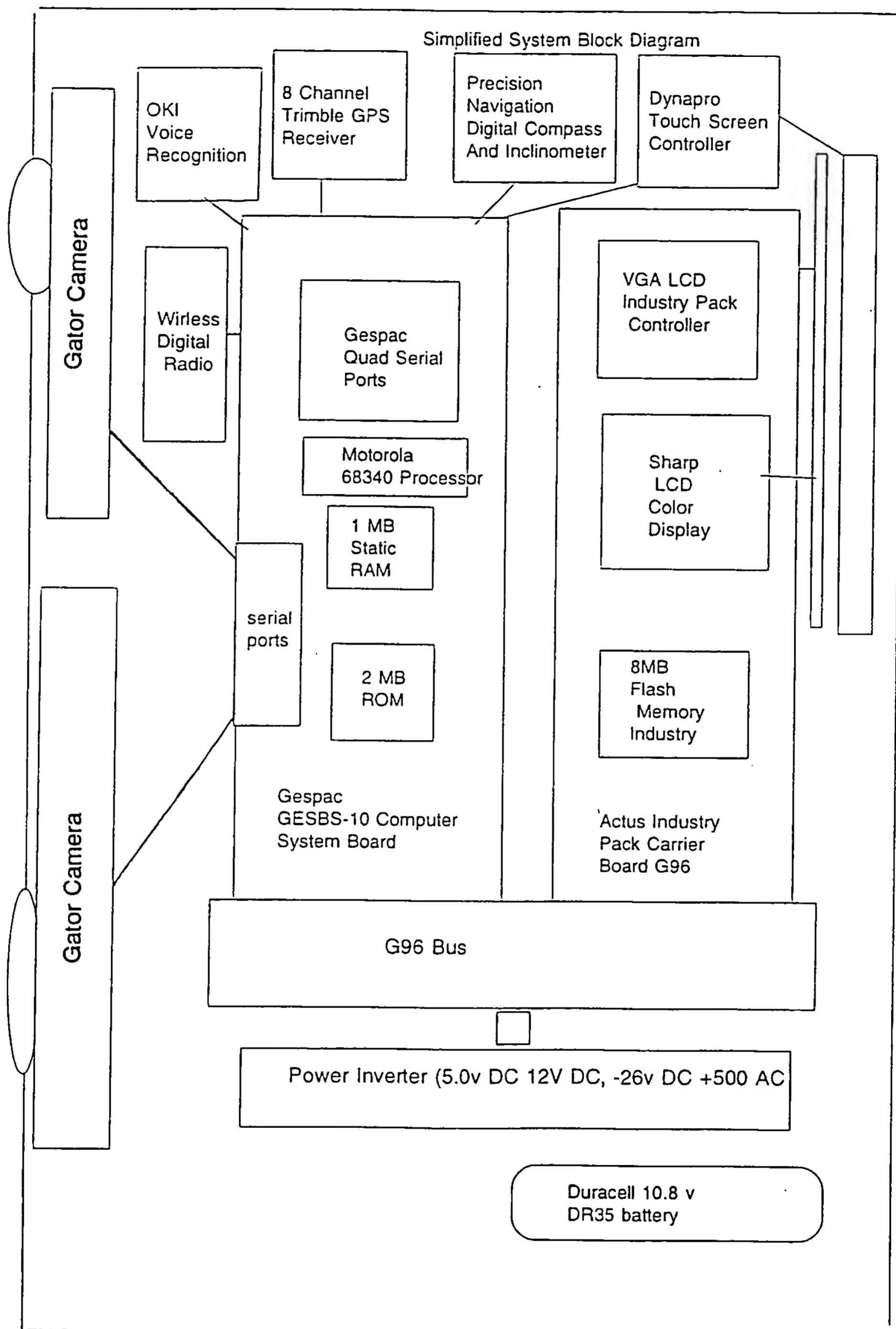
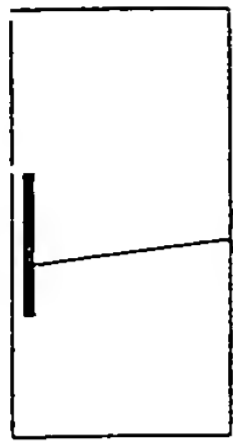
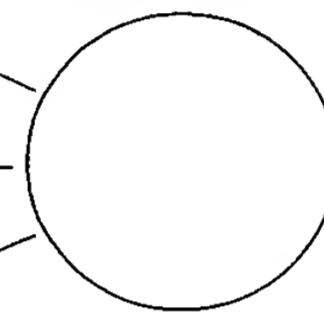


Figure 1

camera one

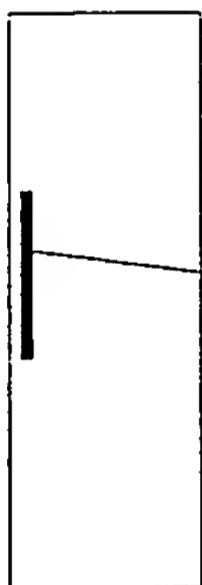
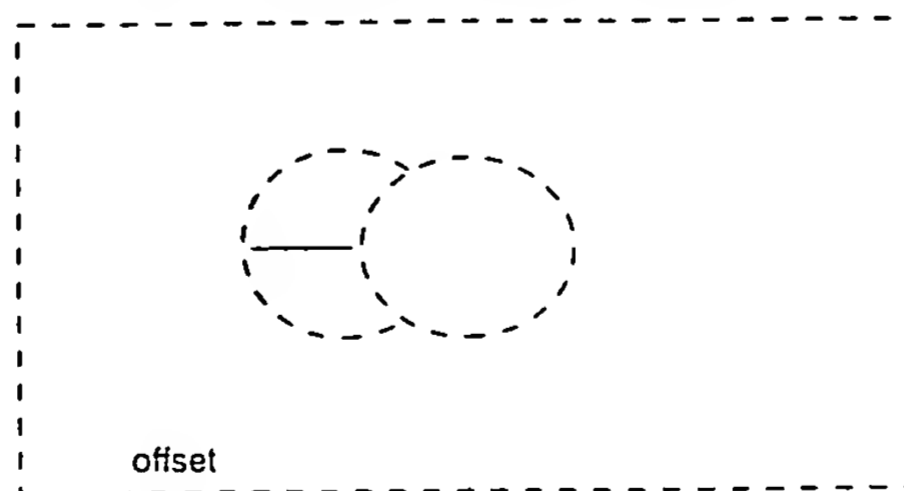


Object under study



distance to object

camera two

Diagram of stereo offset of
two images of same object

$$\text{distance} = \frac{k}{\text{offset}}$$

Figure 2

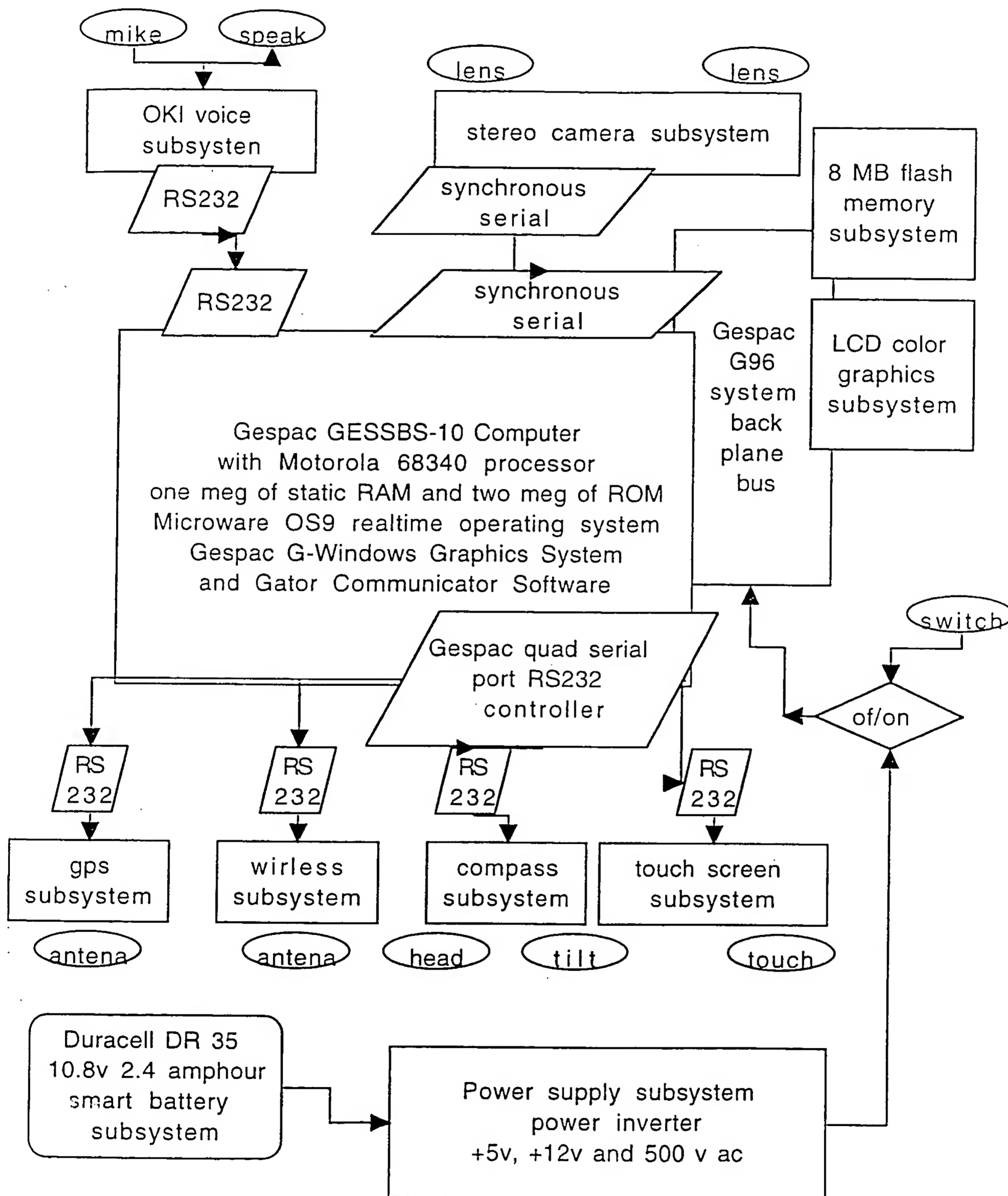


Figure 3

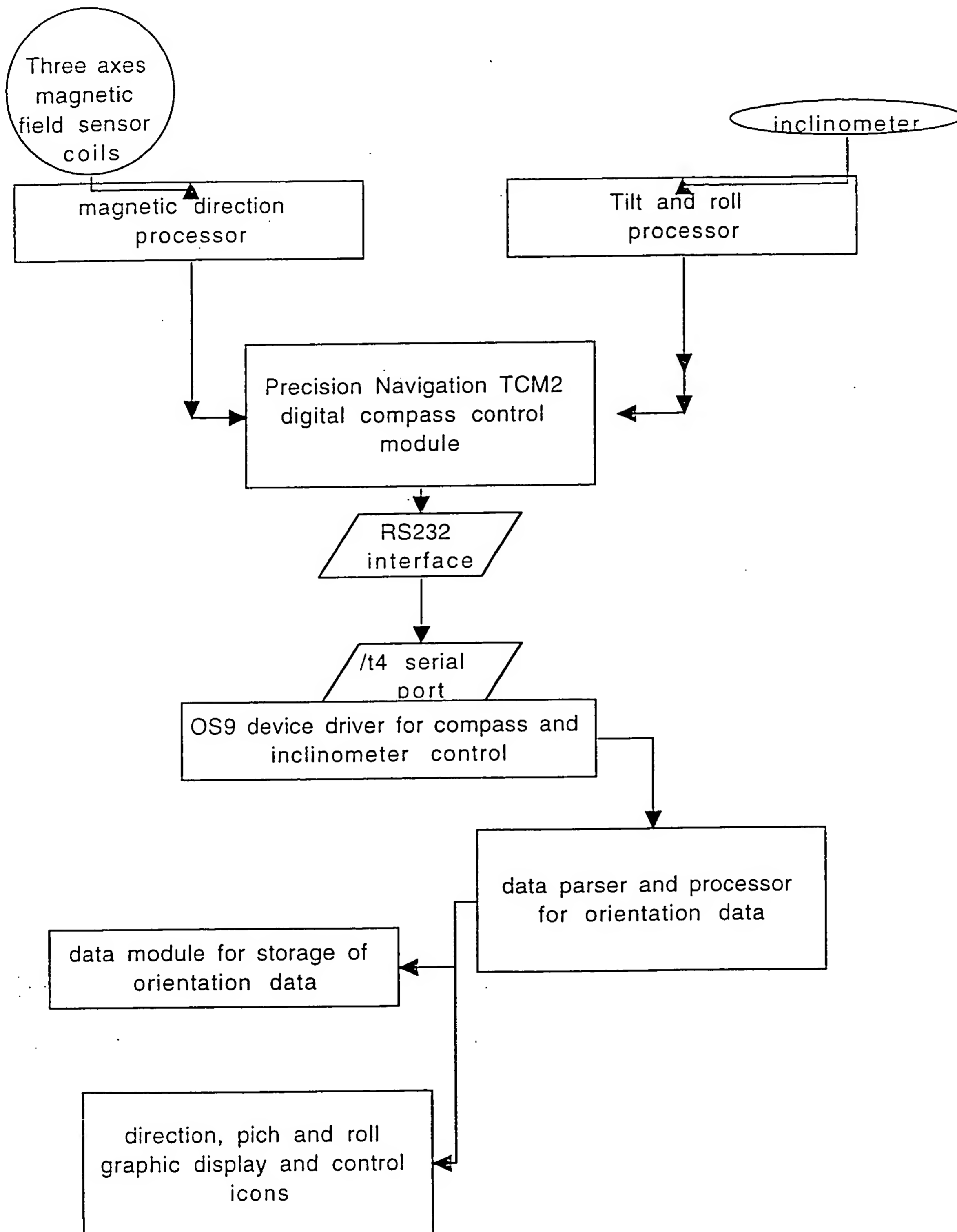


Figure 4

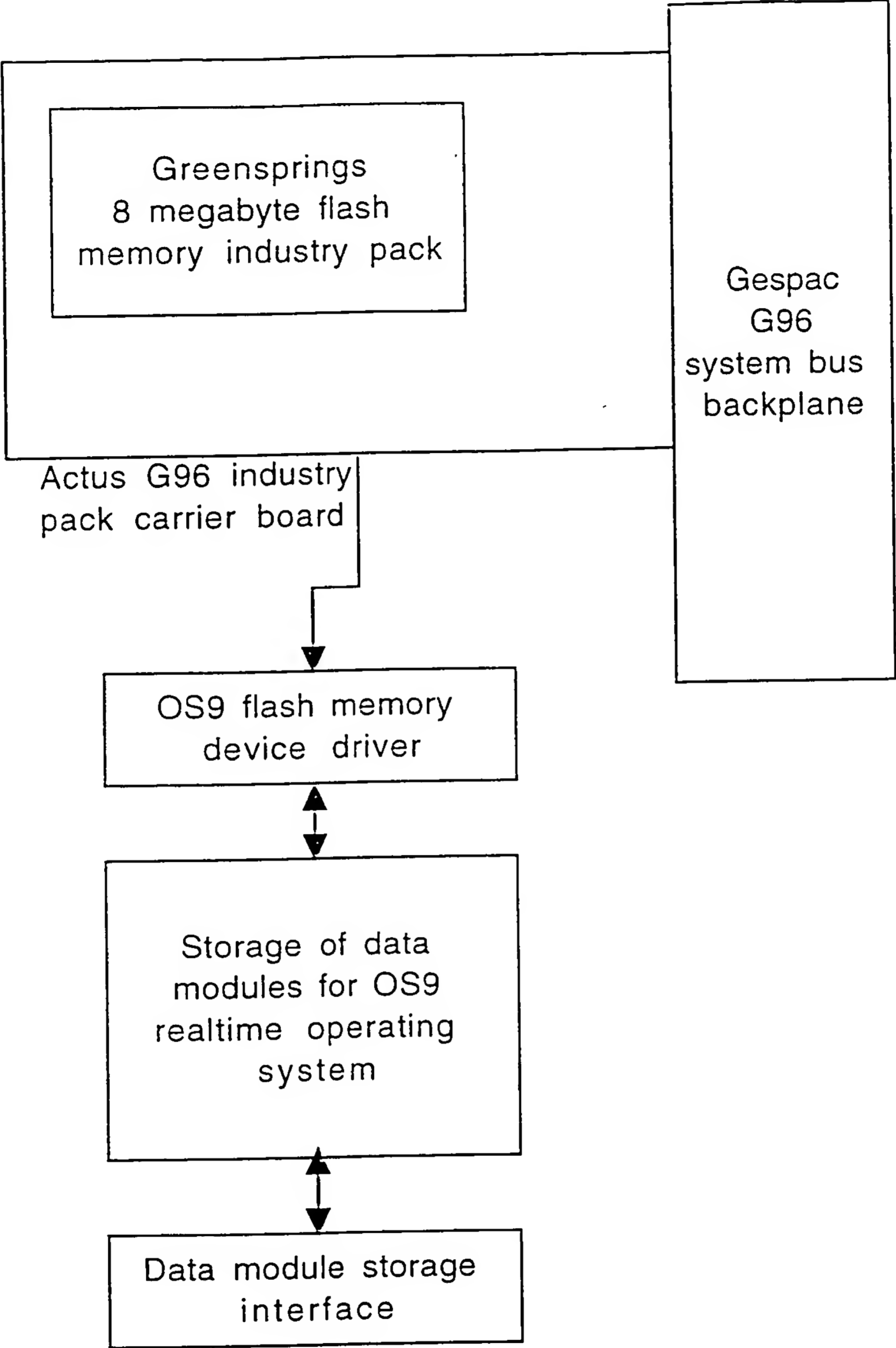


Figure 5

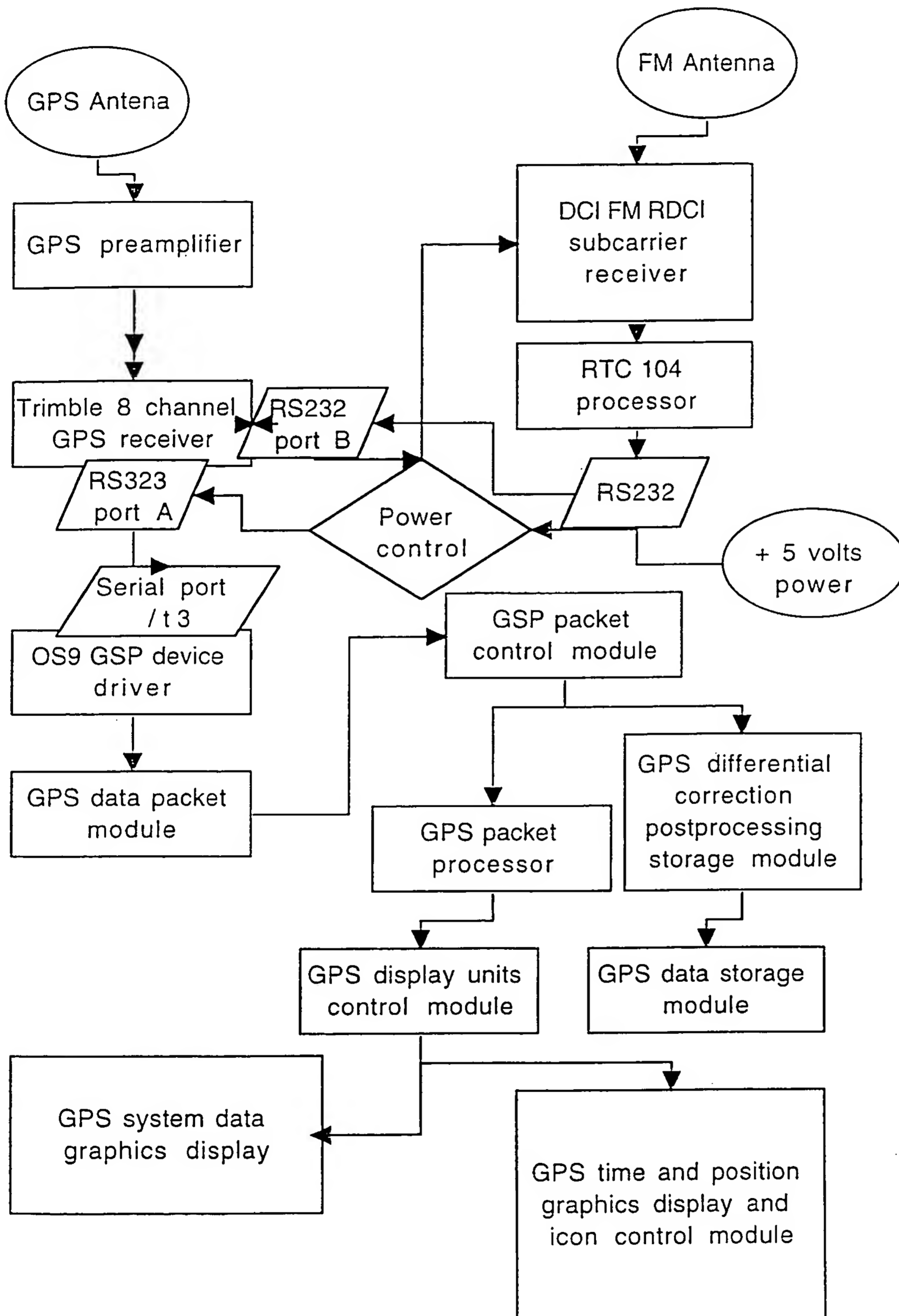


Figure 6

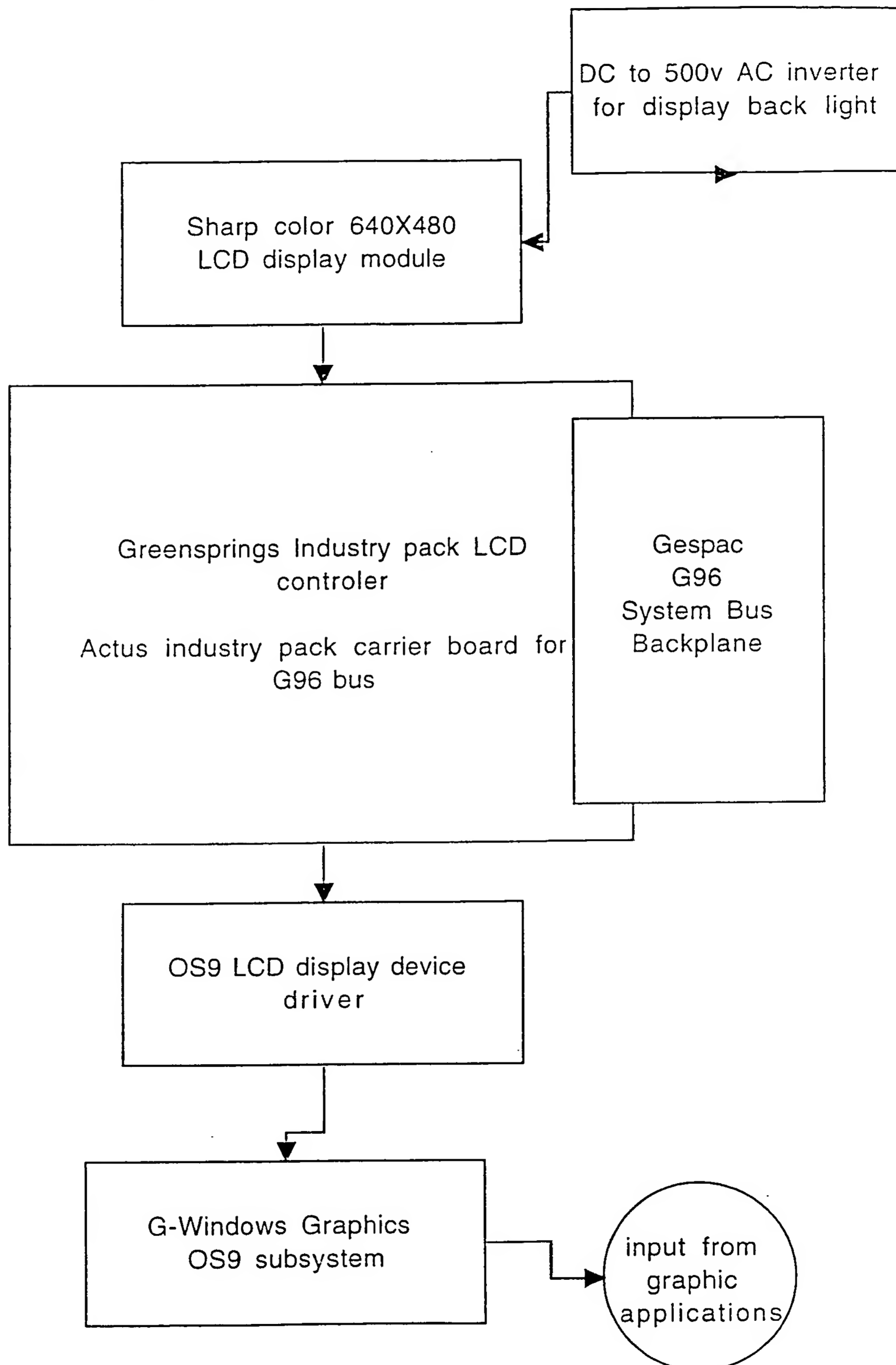


Figure 7

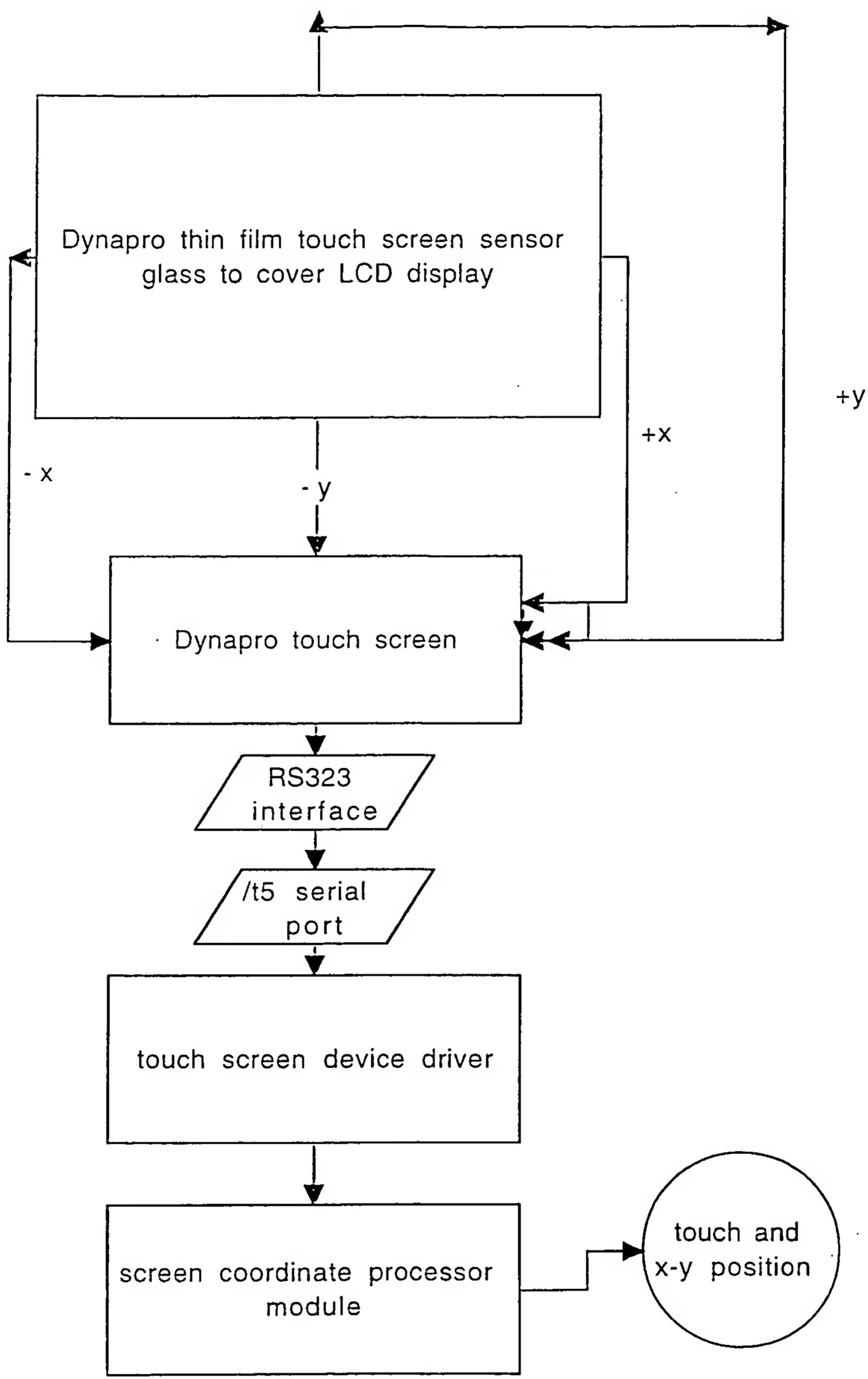


Figure 8

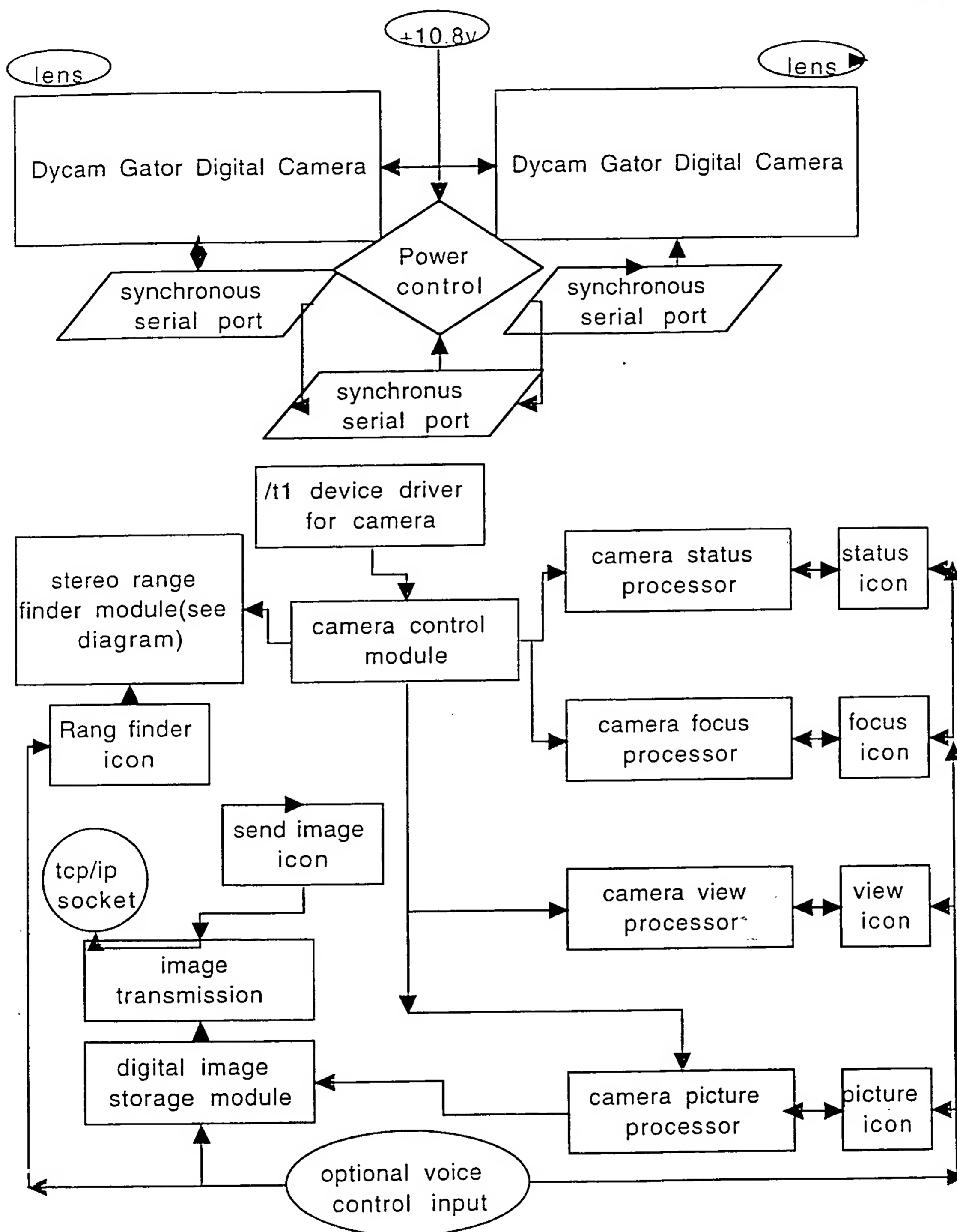


Figure 9

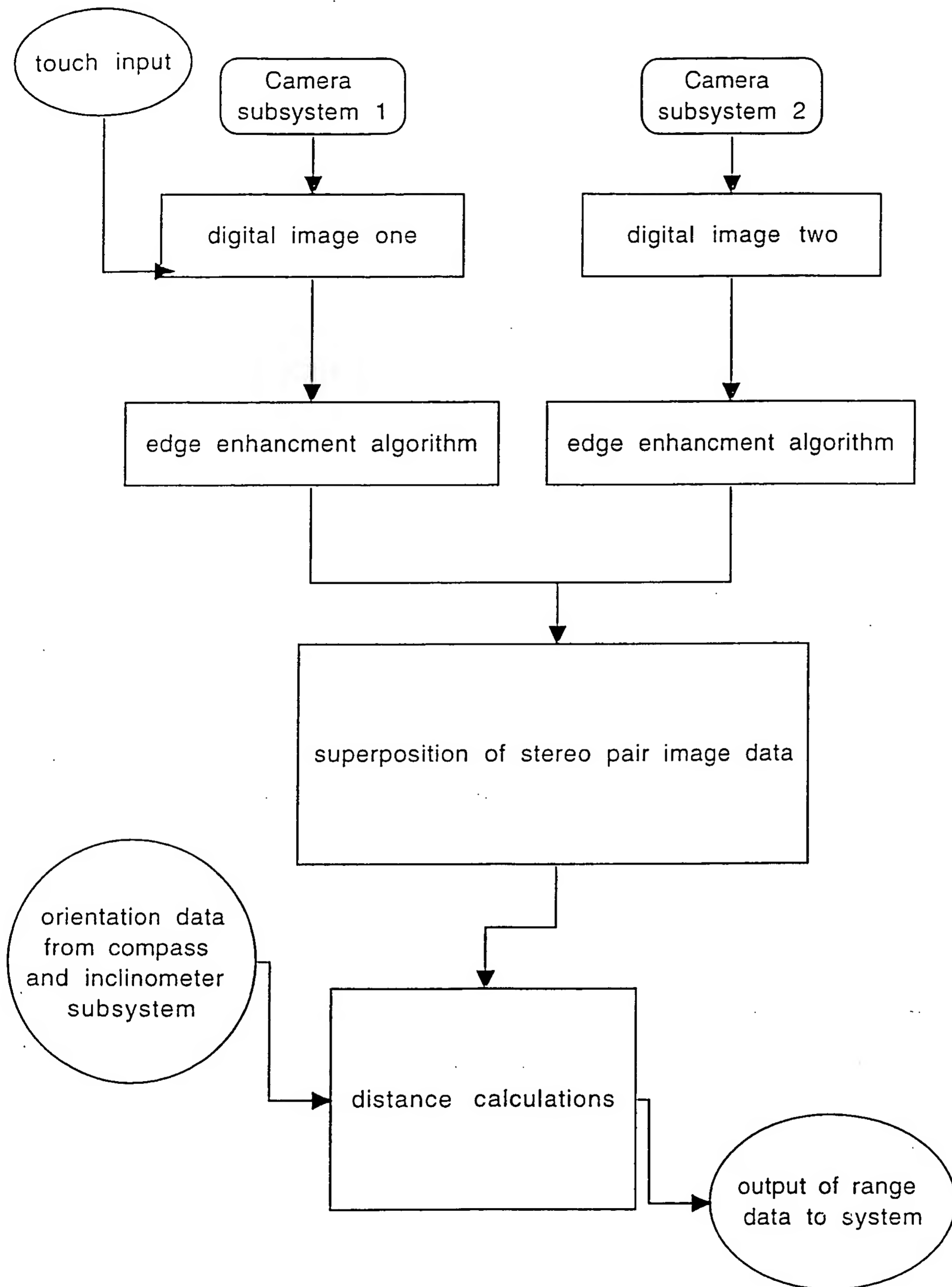


Figure 10

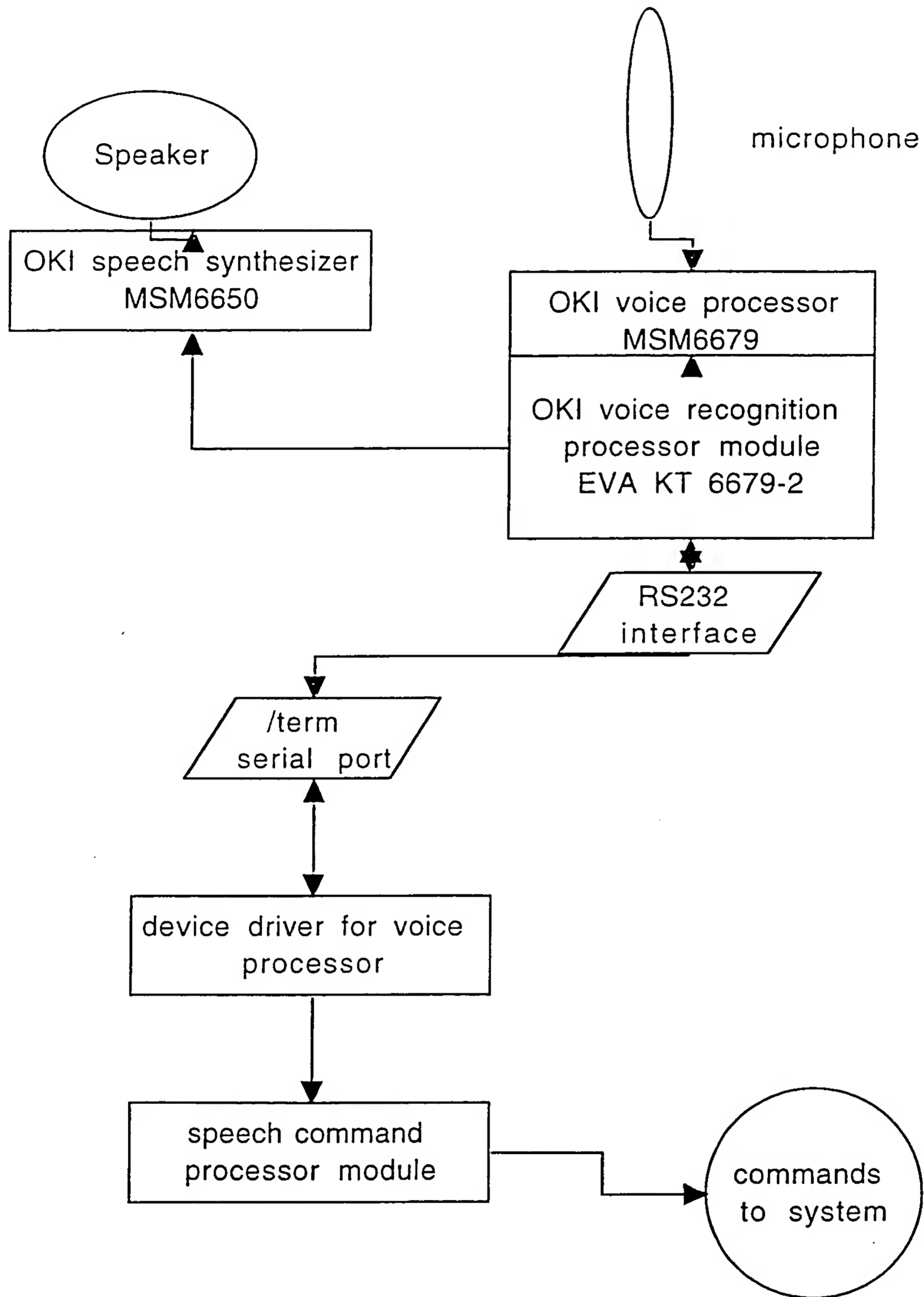


Figure 11

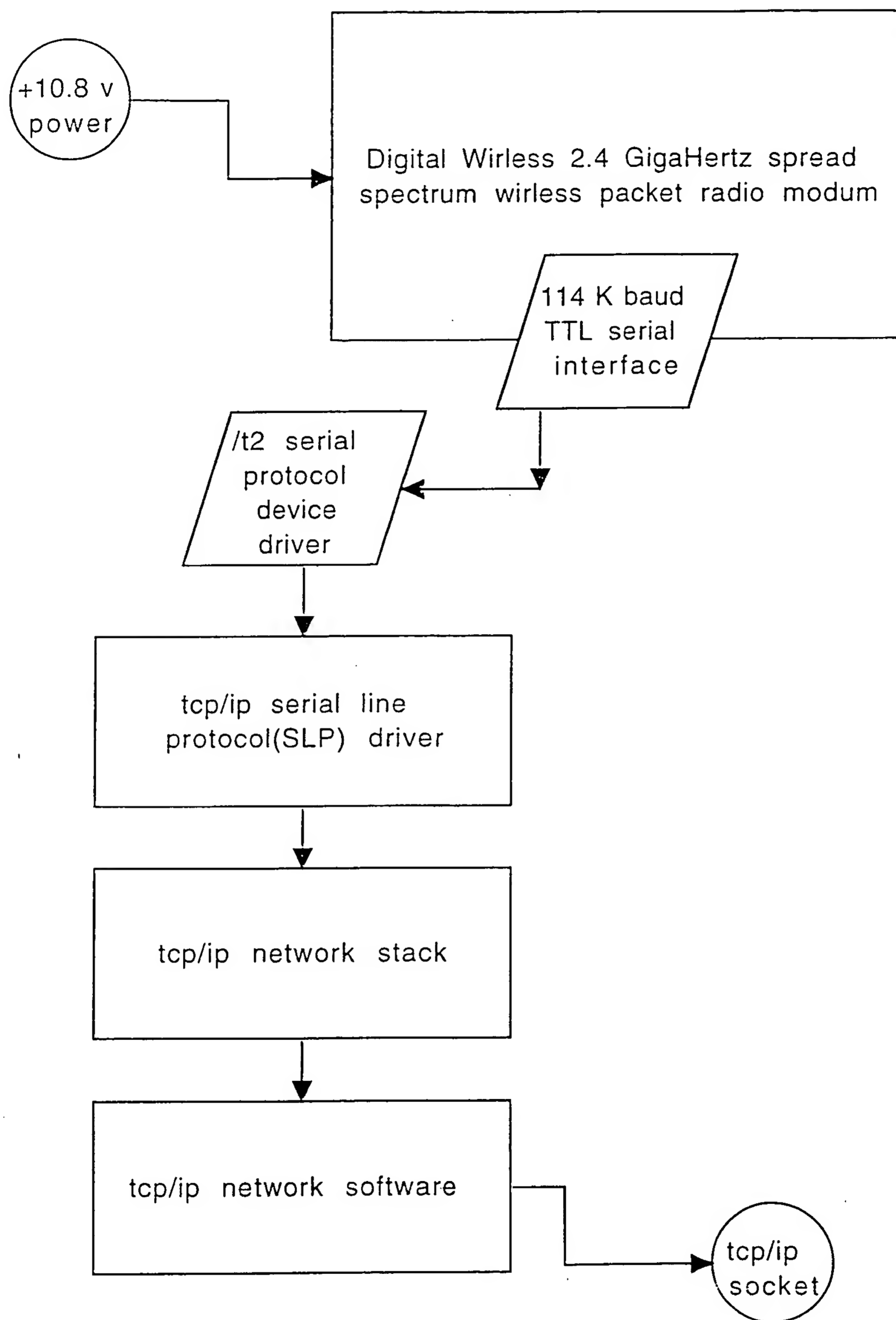


Figure 12